

A Review of Evidence-Based Practices for Students with Autism Spectrum Disorders

A Guide for Parents

By Alan Kurtz

This guide summarizes some of the findings from a *Review of Evidence-Based Practices for Students with Autism Spectrum Disorders* (2008) prepared by the University of Maine Center for Community Inclusion and Disability Studies as part of LEARNS: Maine's Statewide Systems Change Initiative for Inclusive Education, a State-University Cooperative Project between the University of Maine and the Maine Department of Education. This *Review* summarizes the research on the effectiveness of various *comprehensive programs* for students with ASD, as well as research on best practices in the following domains:

- Social development
- Communication
- Cognition and academic skills
- Problem behavior
- Adaptive behavior

The original *Review* is comprised of findings from more than one hundred fifty research and professional documents. It builds on the work of the National Research Council (2001) who completed the most comprehensive assessment of the research on interventions for young children with ASD to date. It expands on the scope of the NRC report, however, by examining more recent research and by reviewing research on treatments used with persons with ASD across the age span. In addition, it reports on outcomes of focus groups or individual interviews with administrators, special and general educators, educational technicians, related service staff, parents, and young adults with Autism Spectrum Disorders (ASDs).

Limits of Existing Research

In many ways, research on evidence-based practices for students with ASD is in its infancy. A number of highly respected researchers within the field have recently documented the serious limitations in the existing research. These limitations make it impossible to draw any firm conclusions about the relative effectiveness of various interventions (Smith et al., 2007; Lord et al., 2005). Among the most serious problems are the following:

- Very limited research comparing comprehensive approaches;
- Lack of group studies, especially those using “randomized control trials;”
- Failure to identify the effects of student variables such as initial IQ scores or measures of language development on outcomes;
- Limited use of procedures that would allow researchers to identify who might benefit from particular interventions or from components of those interventions. (In other words, we may know that an intervention works for some students with ASD but the research seldom tells how many students may benefit or which students are likely to benefit); and
- Limited research on interventions in typical community or school settings.

Much of the research on interventions in ASD is characterized as *single-subject* or *single-case* research. The goal of such research is to determine if a treatment or intervention results in a change in behavior for individuals. Smith et al. (2007) discuss some of the advantages of using single-subject studies:

Single-case designs are a useful starting point for establishing efficacy because they yield evidence that the technique has a clear, replicable effect on a specific behavior. These designs also involved repeated observations, which provide close monitoring of the effects and opportunities that refine the technique. (p. 356)

This type of research is very useful for exploring new treatments, and they show very clearly whether the intervention has led to a particular outcome – usually a change in a specific targeted behavior. It is also very useful in helping researchers determine what components of an intervention are effective. This kind of research tells us little, however, about when and for whom the intervention will work, or how many people on the autism spectrum might benefit from it.

Often researchers want to determine how many people from a group (e.g. school-age students with a diagnosis of autism or other ASD) might benefit from an intervention. They

might also want to determine if students in different subgroups (e.g. those with PDD-NOS versus those with a diagnosis of autism or those with functional speech versus those without functional speech) might benefit from the treatment. When they ask these kinds of questions they usually conduct “between group” studies. These studies compare at least two groups that are as similar to each other as possible at the start of the intervention. All groups might have the same average IQ score or language level. The range within each group can be quite wide, however. One group might get the intervention and the other would not. The group not getting the intervention would act as a “control.” In some cases, researchers might test the effects of several different types of interventions in addition to the outcomes for the control group. So, a researcher might look at treatment outcomes for children getting intervention A, intervention B, and C - no intervention. Other researchers might look at 40 hours of intervention A, 10 hours of intervention A and C - no intervention. The “gold standard” for between-group research is called “randomized clinical trials.” Research subjects are assigned randomly to one of the intervention groups or to the control group. This is the best way to ensure that the groups are as similar as possible to start. This is the kind of research that is usually done to measure the effects of new medical treatments.

A number of the leading researchers of educational interventions in ASD are now calling for changes in the way we conduct research. They argue specifically that we need to give much higher priority to between-group studies, especially those using randomized clinical trials (Lord et al. 2005; Smith et al. 2007). Unfortunately, between-group studies are rare in ASD research and there have been almost no randomized clinical trials of educational interventions. This weakness in the research has made it almost impossible to compare the relative effectiveness of various interventions.

Research Review Findings

In the often bitter debate about effective educational practices for student with ASD, one important fact is often ignored: *In general, current research does not provide practitioners or parents with a clear indication that any single intervention or type of intervention is superior to another*; however, there are studies that support a variety of approaches to supporting students with ASDs (NRC, 2001). This remains as true today as it was when the NRC published their report eight years ago. In other words, it is often difficult to base decisions about which educational strategies should be used for a child with ASD by relying solely on existing research. On the other hand, there is an emerging consensus regarding the common characteristics shared

by all effective programs. Always, of course, decisions about your child's educational programming should be made based on how she or he responds to any strategies that are used.

Comprehensive Programs

Generally, comprehensive programs can be said to exist along a continuum ranging from *Discrete trial-traditional behavioral* (DTTB) to *developmental social-pragmatic* (DSP) (Prizant & Wetherby, 1998). The types of comprehensive programs are described briefly below:

- *Discrete Trial – Traditional Behavioral (DTTB)*. DTTB is based primarily on the work of Lovaas (1987) and the principles of operant conditioning and applied behavior analysis (ABA). It is sometimes referred to as Early Intensive Behavioral Intervention (EIBI). Components of discrete trial programs include: a highly prescribed teaching structure, a focus on teaching discrete behaviors in massed trials, predetermined criteria for determining whether a response is correct, an initial focus on child compliance to teacher demands, and a focus on instruction based on oral language (Prizant & Wetherby, 2000).
- *Contemporary Behavioral Approaches (CBA)*. CBA approaches have emerged from the same ABA tradition as DTTB but incorporate elements of developmental approaches such as instruction in naturalistic environments and following the child's lead, and responding to all attempts to communicate. Examples of CBA include *milieu teaching*, *incidental teaching*, and the *natural language paradigm* (which later evolved into *pivotal response training*). These approaches sometimes are referred to as naturalistic behavioral approaches.
- *Developmental Social-Pragmatic (DSP)*. DSP programs are characterized by instruction in naturalistic contexts, the teacher or parent following the child's lead, the interpretation of all behavior as communicative, scaffolding, support for emotional regulation, and the adjustment of supports to meet a child's developmental needs (Prizant & Wetherby, 1998). Two of the most well known forms of DSP are the *Developmental, Individual-Difference, Relationship-Based* (DIR) model developed by (Greenspan & Wieder, 2006) and the *Social-Communication, Emotional Regulation, Transactional Support Model* (SCERTS) (Prizant, Wetherby, Rubin, Laurent, & Rydell, 2006).

Most of the research on comprehensive approaches has looked at DTTB approaches.

There is some evidence that some children in these programs can make very significant progress in a number of areas including language, IQ score, and inclusion in regular classrooms (Rogers & Viuasmaro, 2008). It is not clear what percentage of students will make significant progress or how scores on initial measures of IQ, adaptive behavior, or language development might affect long-term outcomes (Rogers & Viuasmaro, 2008; Smith et al., 2007, Shea, 2004). Smith, Groen, & Wynn (2000) looked at a DTTB intervention in one of the only randomized controlled trial studies of a comprehensive intervention. They found that, as a group, only students with a label of Pervasive Developmental Disorder – Not Otherwise Specified (PDD-NOS) made significant progress in the program. Only one student with a label of autism made significant progress. This study was relatively small, however. Without further research it is impossible to draw any firm conclusions about who will and will not make significant progress in DTTB programs.

The body of research based on CBA and DSP approaches is much smaller. There are a number of single-subject designs that suggest that students with ASD can make significant progress in CBA programs (Rogers & Viuasmaro, 2008). It is impossible to determine, based on existing research, how many students are likely to benefit from these approaches or which students are most likely to benefit. Research on DSP programs appears promising but the research base is small. There has only been one well designed group study (Aldred, Green & Adams, 2004). These researchers found in their randomized controlled study that students receiving the developmental intervention made significant progress in language, social interaction, and total score on a measure of autism characteristics. Conclusions based on this study are also limited by the small number of participants.

The members of the NRC (2001) concluded that there is no evidence demonstrating that any single comprehensive program is appropriate for all children. They contended that there was evidence that a variety of programs, across the traditional behavioral – developmental social pragmatic continuum, can be effective.

The NRC (2001) identified a number of features of high quality programs for young children with ASD. These included the following:

- *Intensity* – a minimum of five days a week, 25 hours a week, and 12 months a year;
- Use of *planned teaching opportunities*;

- *Sufficient adult attention* in one-to-one and small group instruction so that individual goals can be addressed;
- *Early intervention*;
- Goals that include *functional spontaneous communication, cognitive development* and *play skills*, and *proactive approaches to behavior problems*;
- Careful *monitoring* of progress toward goals; and
- Active *family involvement*.

In a more recent study on effectiveness of early intervention for children with autism, Levy, Kim, & Olive (2006) reported that a variety of types of programs can lead to significant positive outcomes for children with ASD. Important features of these programs include *parent training, intensive behavioral, multi-component, and language-based* programs.

Interventions Targeting Social Interaction

Researchers have identified a number of strategies that appear to be effective for teaching social skills to children with ASD, including the following:

- Supporting *non-disabled peers to teach social skills* to students with ASD. Peer-mediated strategies, in general, have been found to be more effective than adult-mediated ones (DiSalvo & Oswald, 2002; Weiss & Harris, 2001).
- *Participation in regular classrooms* - Interaction with typically developing peers appears to be a necessary, but not sufficient, condition for improving social skills (Levy, Kim & Olive, 2006; Bellini, Peters, Bonner, & Hoph, 2007; McConnell, 2002). Peers usually need to be prompted and taught specific strategies for interacting with students with ASD.
- Participation in *cooperative learning groups* (Duigan, Kamps, & Leonard, 1995) and *peer tutoring* in academic activities (Kamps, Barbetta, Leonard, & Delquardri (1994).
- *Behavioral approaches* in which the parent or teacher engages in direct instruction – There is a large body of evidence demonstrating the effectiveness of behavioral procedures for changing individual behaviors (Weiss & Harris, 2001).
- *Naturalistic adult-child approaches* - There is some evidence suggesting that approaches such as following the child's lead or imitating the child may lead to improvements in

shared attention and symbolic play (Dawson & Galpert, 1990; Aldred, Green, & Adams, 2004). These outcomes are considered to be precursors to later social development.

- *Video modeling* and *self-modeling* – There is some evidence that the use of video models of other students engaging in an appropriate social behavior or videotape of a student him- or herself engaging in that behavior may lead to improvements in social behavior (Ayers & Langone, 2005; Bellini et al., 2007).
- *Social Stories* – The research on the use of social stories is very limited but it suggests they may be useful for some students with ASD, especially those with very well developed speech or literacy skill.

According to the NRC (2001), a combination of developmental and behavioral approaches may be very effective in increasing some early predictors of social development, namely joint attention and symbolic play. Some research shows that DTTB programs can lead to greater inclusion in regular classrooms (Lovass, 1987; McEachin, Lovaas, & Smith, 1993; Sallows & Graupner, 2005), but this result has not been replicated in all studies of this style of intervention. Some preliminary research on comprehensive DSP programs indicates that they may lead to significant improvements in social outcomes (Aldred, Green, & Adams, 2004; Solomon, Necheles, Ferch, & Bruckman, 2007; Mahoney & Perales, 2003). CBA programs have also been shown to lead to positive social outcomes in a number of single-subject design studies involving small numbers of participants (NRC, 2001; Rogers & Viuasmara, 2008).

Communication

As many as 50% of individuals with autism never develop functional speech. Many individuals with ASD also have difficulty with receptive language, including understanding of spoken language, gestures, and body language. Evidence suggests that a number of strategies can be effective in supporting development of both expressive and receptive communication, including the following:

- *Functional Communication Training (FCT)* – FCT involves using functional behavior assessment to identify communication responses that can be substituted for problem behavior. There is a great deal of evidence that this is an effective strategy for reducing problem behaviors in individuals with ASD, although there is limited research on maintenance of the behavior and generalization to other environments (Mancil, 2006).

- *Augmentative and Alternative Communication (AAC)*– There is great deal of research demonstrating that individuals with ASD with little functional speech can benefit from the use of *graphic symbols*, *manual signing*, and *speech generation* devices (Schlosser and Wendt, 2008). One of the most common forms of AAC for persons with ASD is *Picture Exchange System (PECS)*. According to Schlosser and Wendt, the research on PECS is surprisingly limited but it does suggest that it may be very effective for some students with ASD. A number of studies indicate that AAC can lead to increases in speech. There is virtually no evidence suggesting that AAC interferes with the development of spoken language.
- *Teaching Initiation of Communication* – There is some preliminary evidence suggesting pivotal response training – a contemporary behavioral intervention – can lead to an increase in the initiation of communication (Koegel, Carter & Koegel, 2003; Koegel, 1995; NRC, 2001).
- *Behavioral Strategies* –There is a large literature base, made up primarily of single-subject design studies, indicating that behavioral strategies such as prompting, modeling, shaping, time delay, and reinforcement (Ogletree, et al., 2007) are effective in teaching communication skills to students with ASD.
- *Contemporary Behavioral Approaches* – There is some evidence that contemporary behavioral approaches such as *incidental teaching*, *pivotal response training*, and *milieu training* may be more effective than traditional discrete trial approaches – both in teaching students new skills and in helping them to generalize the skills to other environments (Delaprato, 2001). A number of specific communication intervention strategies associated with contemporary behavioral approaches have been found to be effective with children with ASD, including instruction in natural environments and building on the child's interests.
- *Scripted Interactions* – A number of studies show that students with ASD can be taught to interact with other students using scripts, and that these scripts are often used spontaneously (Goldstein, 2001). Students sometimes vary the scripts appropriately or elaborate upon them.

Ogletree, Oren & Fischer (2007) summarize some of the features of a good

communication instruction for young children with ASD:

- Early entry into intervention (By age 3)
- Active engagement in intensive instruction (25 hours per week or more)
- Repeated, planned teaching opportunities with low student-to-teacher ration
- Systematic developmentally appropriate instruction with objects
- Inclusion of family
- Ongoing assessment and programming changes when needed
- Instructional settings with typically developing children and adults
- Interactional approach in which *skills taught are a good fit between the person's ability and his or her current environments.*

Cognitive and Academic Skills

A number of specific cognitive deficits have been hypothesized as being primary deficits that explain other differences in development in individuals with ASD. These include a lack of theory of mind, weak central coherence, and executive function deficits. There is no research indicating that intervention targeting these deficits results in changes in other characteristics associated with ASD.

There is some evidence that participation in a variety of intensive early intervention programs can lead to significant improvement in IQ scores, although the use of IQ scores exclusively as a measure of cognitive development may not be a valid measure (Shea, 2004). The NRC (2001) believes that adaptive behavior may be a better indicator than IQ of later cognitive development. Several studies of children in traditional discrete trial programs demonstrate that some can make substantial advances in IQ scores; however, there is also evidence that as many as 50% of students in these programs may not make significant progress. In the only study using randomized controls, researchers found that none of the students with autism - as opposed to those with PDD – NOS - achieved significant increases in IQ scores (Smith, Groen, & Wynn, 2000). As noted above, this was a small study and we cannot use it to draw conclusions about which persons with ASD might or might not make significant progress in DTTB programs.

A number of small single-subject design studies suggest that CBAs may lead to significant cognitive gains (Whalen & Schreibman, 2003; Dunlap & Kern, 1996). Researchers

looking at the effects of CBA typically look at social and communicative development, and do not measure cognitive development directly.

Similarly, studies of DSP programs tend to focus on gains in adaptive behavior or functional/emotional development rather than IQ. Some initial research indicates that some children with ASD may achieve significant gains in adaptive behavior as a result of participating in these programs. In one non-controlled study of a developmental approach (Denver Model), Rogers and DiLalla (1991) reported significant cognitive gains for children with ASD.

There are a number of studies examining the development of literacy skills among students with ASD. Researchers have found that many students can learn to read and that IQ score may not be a good predictor of success in literacy instruction (Koppenhaver & Erickson, 2003; Mayes & Calhoun, 2003; Calhoun, 2001). A variety of strategies have been shown to be successful. Some preliminary evidence indicates that students with ASD may benefit from the kind of balanced literature-based program known to be effective for all children (Koppenhaver & Erickson, 2003). There have been a number of studies showing that many students with ASD can learn to identify sight words through behavioral stimulus-discrimination procedures. Mirenda (2008) suggests that this approach may result in students failing to gain the background knowledge that is necessary for comprehension of text. Unfortunately, there is no research comparing the effectiveness of balanced literature-based programs with programs focusing on identifying sight words. Some preliminary evidence suggests that some students with ASD may learn well through computer-based instruction, and that this kind of instruction can be highly motivating for some students.

Problem Behavior

The NRC (2001) identified a number of features that were characteristic of effective programs for promoting social development among young children with ASD. These include the following:

- Curriculum that emphasizes *direct instruction*, attends to *elements of environment* essential for learning – especially social stimuli, and teaches *imitation, comprehending and using language, playing, and social interaction*.
- A focus on *prevention*
- Predictability in *routine*
- Highly *supportive teaching environments* and use of *generalization* strategies

- Use of *functional behavior assessment*
- Use of *transition plans*
- *Family involvement*
- *Early intervention*
- *Small teacher-to-child ratios*
- *Active engagement* from 20 to 40 hours per week

Research reveals a number of specific strategies that have been found to be effective in addressing problem behaviors among children across the age span who have ASD including the following:

- *Behavioral Strategies* – A great deal of single-subject research demonstrates the effectiveness of applied behavior analysis in changing specific behaviors. In a review of single-subject design studies of applied behavior analysis, Campbell (2005) found that problem behaviors were reduced by about 76%.
- *Positive Behavioral Supports* - There is an emerging evidence base suggesting that positive behavior supports - with its emphasis on choice, self-determination, and enhancement of one's chosen life style, systems change, environmental alterations, skill instruction, and positive behavioral consequences - can lead to significant improvements in problem behavior (Horner et al., 2002). Positive behavioral supports seem especially effective when used in combination with functional behavior assessment.
- *Functional communication training* - As noted above, research suggests that FCT can be very effective in reducing problem behaviors in students with ASD (Goldstein, 2001).
- *Self-management* - Self-management strategies involve teaching a student to discriminate appropriate behavior, to evaluate his or her behavior, to monitor behavior and provide appropriate reinforcement. A number of single-subject design studies demonstrate that this can be an effective way to reduce problem behaviors for some students with autism (Harrower & Dunlap, 2001).

There is limited research on the effects of participation in various types of comprehensive programs on problem behaviors. Self-management strategies are often used as part of *pivotal response training* (a CBA approach). DSP research focuses on functional-emotional growth and

not behavior *per se*. The fact that some students with autism who participated in DTTB programs are included in regular classrooms and are largely undistinguishable from their peers suggests that their level of problem behavior is not atypical.

Adaptive Behavior

A number of single-subject research studies demonstrate that behavioral strategies can be used to teach specific adaptive behaviors. There are several studies indicating that children in comprehensive DTTB programs can make significant progress in adaptive behavior (e.g. Lovaas, 1987; McEachin, et al., 1993, Howard et al., 2005). In a randomized control trial experiment, however, Smith, Groen, and Wynn (2000) found no difference in outcomes for children receiving intensive discrete-trial behavioral intervention and those receiving far fewer hours of intervention.

Some research has found that children in CBA programs can also make significant progress in adaptive behavior. Unfortunately, there is very little research using control groups, and only one study in which participants were randomly assigned to conditions.

Some limited research on DSP programs indicates that they may lead to improvements in adaptive behavior (Rogers & Lewis, 1989; Rogers & DiLalla, 1991). These studies were not controlled, however. In a randomized controlled trial of a developmental approach there was evidence suggesting that students made improvements in adaptive behavior but that the difference was not statistically significant (Aldred, Green & Adams, 2004).

There is a great deal of evidence indicating that behavioral strategies can be used to teach adaptive behavior. Unfortunately, there is very little research using control groups, and none using random assignment to conditions. In addition, much of this research does not identify participants specifically as students with ASD.

Summary

As noted throughout this summary, there are a number of educational strategies that have been found to be effective for teaching students with ASD. At the same time, there is a great deal we do not know – especially about how many students might benefit from a particular intervention or which students are likely to benefit from an intervention. Increases in funding for ASD research are likely to lead to improvements in the quality of research in the near future. Between-group studies and randomized controlled trials are likely to provide us with a great deal

of guidance about what strategies are likely to work with particular children.

When considering evidence-based practices, it is important to remember that each child with ASD is unique. Ultimately, what works for your child or any child with an ASD is something that can only be determined when parents and teachers carefully monitor the effectiveness of the strategies they use. It is equally important for teachers to make changes to those strategies when the data indicate they are not working. The good news is that existing research does provide us with guidance about many different options we can try when we modify and individualize educational supports.

A Review of Evidence-Based Practices for Students with Autism Spectrum Disorders: A Guide for Parents summarizes some of the findings from a *Review of Evidence-Based Practices for Students with Autism Spectrum Disorders* (2008), developed by Alan Kurtz, Ph.D. Candidate and Research Associate, the University of Maine Center for Community Inclusion and Disability Studies, as part of LEARNS: Maine's Statewide Systems Change Initiative for Inclusive Education, a State-University Cooperative Project between the University of Maine and the Maine Department of Education (2009).



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